Accounting for the New Gains from Trade Liberalization

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New gains from trade

- One of the central messages of the recent empirical trade literature is that the selection effects associated with trade liberalization bring about large welfare gains
- Trade forces the least productive domestic firms to exit out of production bringing about domestic productivity gains (e.g. Trefler, 2004)
- Trade allows additional foreign firms to enter into exporting bringing about import variety gains (e.g. Broda and Weinstein, 2006)

New losses from trade?

- This message appears one-sided from the perspective of a standard Melitz (2003) model which formalizes such selection effects
- Shouldn't the exit of domestic firms out of production also bring about domestic variety losses in addition to domestic productivity gains?
- And shouldn't the entry of additional foreign firms into exporting also bring about import productivity losses in addition to import variety gains?

Our paper

- Against this background, we re-examine the selection effects of trade liberalization through the lens of a decomposition of the gains from trade
- We first derive an exact decomposition of the gains from trade into "traditional" and "new" gains based on a generalized Melitz (2003) model
- We then apply this decomposition to measure the "new" gains from trade reaped by Canada as a result of the Canada-US Free Trade Agreement (CUSFTA)
- Our main finding is that Canada actually suffered from "new" welfare losses once domestic variety and import productivity losses are taken into account

Conceptual points

- Our decomposition not only confirms the relevance of these selection losses but also clarifies that productivity effects only play a modulating role
- The domestic productivity gains only adjust for the fact that the exiting firms are less productive than the continuing ones but never overturn the variety losses
- The import productivity losses only adjust for the fact that the entering exporters are less productive than the continuing ones but never overturn the variety gains
- The distinction between variety and productivity effects is somewhat artificial and we will see that what really matters is the combined market share of all affected firms

Contribution

- We provide a novel decomposition of the gains from trade based on a generalized Melitz (2003) model which isolates selection-induced variety and productivity effects
- We apply this decomposition in a theory-consistent manner to obtain the first estimate of such effects which takes all relevant selection margins into account
- By doing so, we broaden the scope of the empirical literature beyond its conventional focus on selection gains and also improve on its estimation of productivity effects

Literature

Studies measuring the "new" gains from trade

Tybout et al (1991), Levinsohn (1993), Feenstra (1994), Harrison (1994), Tybout and Westbrook (1995), Krishna and Mitra (1998), Pavcnik (2002), Broda and Weinstein (2006), Feenstra (2010), Topalova and Khandewal (2011), and Caliendo et al (2015)

Studies focusing on the effects of CUSFTA

Head and Ries (1999), Trefler (2004), Breinlich (2008), Lileeva (2008), Lileeva and Trefler (2010), Melitz and Trefler (2012), and Breinlich and Cunat (forthcoming)

New trade models, same old gains?

Arkolakis et al (2008), Atkeson and Burstein (2010), Baldwin and Forslid (2010), Arkolakis et al (2012), Redding and Melitz (2015), Ossa (2015)

Overview

- Basic decomposition
- Overview of extensions
- Before-after application
- Diff-in-diff results

Methodology - Basic setup

- We assume that consumers have CES preferences over differentiated varieties sourced from many countries
- These varieties are produced by monopolistic firms with heterogeneous productivities using labor as the only input
- We say that M_{ij} firms from country i serve country j but remain agnostic about what drives selection into a market
- We allow for firm productivities to follow general productivity distributions and consider Pareto as a special case

Methodology - Key conditions

- Then, bilateral trade flows can be expressed in terms of average prices:

$$X_{ij} \propto M_{ij} \left(\frac{\tilde{p}_{ij}}{P_j} \right)^{1-\sigma} Y_j$$

- And averages prices can be written in terms of average productivity:

$$\tilde{p}_{ij} \propto \frac{w_i \tau_{ij}}{\tilde{\varphi}_{ij}}$$

- We also assume that total income is proportional to labor income:

$$Y_j \propto w_j L_j$$

Methodology - Using first condition

- Defining $\lambda_{ij} = X_{ij}/Y_j$, price index changes can be decomposed as:

$$\ln \frac{P_j'}{P_j} = \ln \frac{\tilde{p}_{ij}'}{\tilde{p}_{ij}} - \frac{1}{\sigma - 1} \ln \frac{M_{ij}'}{M_{ij}} + \frac{1}{\sigma - 1} \ln \frac{\lambda_{ij}'}{\lambda_{ij}}$$

- Following Sato (1976) and Vartia (1976) we define the weights:

$$\bar{\lambda}_{ij} = \left(\frac{\lambda_{ij}' - \lambda_{ij}}{\ln \lambda_{ij}' - \ln \lambda_{ij}} \right) / \left(\sum_{m=1}^{N} \frac{\lambda_{mj}' - \lambda_{mj}}{\ln \lambda_{mj}' - \ln \lambda_{mj}} \right)$$

- Using these weights, the price index decomposition becomes:

$$\ln \frac{P_j'}{P_j} = \sum_{i=1}^{N} \bar{\lambda}_{ij} \left(\ln \frac{\tilde{p}_{ij}'}{\tilde{p}_{ij}} - \frac{1}{\sigma - 1} \ln \frac{M_{ij}'}{M_{ij}} \right)$$

Methodology - Using second condition

- Changes in average prices can be decomposed into three components:

$$\ln \frac{\tilde{p}'_{ij}}{\tilde{p}_{ij}} = \ln \frac{\tau'_{ij}}{\tau_{ij}} + \ln \frac{w'_i}{w_i} - \ln \frac{\tilde{\varphi}'_{ij}}{\tilde{\varphi}_{ij}}$$

- Productivity changes can be separated into within and between effects:

$$\ln \frac{\tilde{\varphi}'_{ij}}{\tilde{\varphi}_{ij}} = \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} + \left(\ln \frac{\tilde{\varphi}'_{ij}}{\tilde{\varphi}_{ij}} - \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} \right)$$

- These results combine to our exact decomposition of price index changes:

$$\ln \frac{P'_j}{P_j} = \sum_{i=1}^{N} \bar{\lambda}_{ij} \left(\ln \frac{\tau'_{ij}}{\tau_{ij}} + \ln \frac{w'_i}{w_i} - \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} \right) + \sum_{i=1}^{N} \bar{\lambda}_{ij} \left(-\frac{1}{\sigma - 1} \ln \frac{M'_{ij}}{M_{ij}} - \left(\ln \frac{\tilde{\varphi}'_{ij}}{\tilde{\varphi}_{ij}} - \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} \right) \right)$$

Methodology - Using third condition

- Using $Y_j \propto w_j L_j$, this then yields our exact decomposition of welfare changes:

$$\ln \frac{W_j'}{W_j} = \underbrace{\sum_{i=1}^{N} \bar{\lambda}_{ij} \left(-\ln \frac{\tau_{ij}'}{\tau_{ij}} + \left(\ln \frac{w_j'}{w_j} - \ln \frac{w_i'}{w_i} \right) + \ln \frac{\tilde{\varphi}_{ij}^{c\prime}}{\tilde{\varphi}_{ij}^{c}} \right)}_{\text{"traditional" gains from trade}} + \underbrace{\sum_{i=1}^{N} \bar{\lambda}_{ij} \left(\frac{1}{\sigma - 1} \ln \frac{M_{ij}'}{M_{ij}} + \left(\ln \frac{\tilde{\varphi}_{ij}'}{\tilde{\varphi}_{ij}} - \ln \frac{\tilde{\varphi}_{ij}^{c\prime}}{\tilde{\varphi}_{ij}^{c}} \right) \right)}_{\text{"new" gains from trade}}$$

- The "traditional" gains capture what would be the only gains if all firms were continuing firms
- The "new" gains describe the additional gains due to changes in the set of firms serving country j
- Foreign entry into exporting brings about "new" gains and domestic exit out of production brings about "new" losses

▸ Melitz-Pareto

Methodology - Sufficient statistics

- Using our first two conditions we can write:

$$X_{ij} \propto M_{ij}\left(\frac{w_i\tau_{ij}}{\tilde{\varphi}_{ij}}\frac{1}{P_j}\right)^{1-\sigma} Y_j$$

$$X_{ij}^c \propto M_{ij}^c\left(\frac{w_i\tau_{ij}}{\tilde{\varphi}_{ij}^c}\frac{1}{P_j}\right)^{1-\sigma} Y_j$$

- This immediately yields our measurement equation:

$$\frac{1}{\sigma-1}\ln\left(\frac{X_{ij}^c/X_{ij}}{X_{ij}^{c'}/X_{ij}'}\right) = \frac{1}{\sigma-1}\ln\left(\frac{M_{ij}'}{M_{ij}}\right) + \left(\ln\frac{\tilde{\varphi}_{ij}'}{\tilde{\varphi}_{ij}} - \ln\frac{\tilde{\varphi}_{ij}^{c'}}{\tilde{\varphi}_{ij}^c}\right)$$

- Which can be further separated by substituting $X_{ij} = M_{ij}\tilde{r}_{ij}$ and so on:

$$\frac{1}{\sigma-1}\ln\left(\frac{X_{ij}^c/X_{ij}}{X_{ij}^{c'}/X_{ij}'}\right) = \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^c}{M_{ij}}}_{\text{variety loss}} + \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^c}{\tilde{r}_{ij}}}_{\text{prod. gain}}}_{\text{loss from exit}} - \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^c}{M_{ij}'}}_{\text{variety gain}} - \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c'}}{\tilde{r}_{ij}'}}_{\text{prod. loss}}}_{\text{gain from entry}}$$

Methodology - Additional comments

- We can calculate the overall gains up to within-firm productivity effects using:

$$\ln \frac{W_j'}{W_j} = -\frac{1}{\sigma - 1} \ln \frac{\lambda_{jj}'}{\lambda_{jj}} + \frac{1}{\sigma - 1} \ln \frac{M_{jj}'}{M_{jj}} + \ln \frac{\tilde{\varphi}_{jj}'}{\tilde{\varphi}_{jj}}$$

- Our "new" gains formula is closely related to the Feenstra-Ratio:

$$\ln \frac{W_j'}{W_j} = \sum_{i=1}^{N} \bar{\lambda}_{ij}^c \left(-\ln \frac{\tau_{ij}'}{\tau_{ij}} + \left(\ln \frac{w_j'}{w_j} - \ln \frac{w_i'}{w_i} \right) + \ln \frac{\tilde{\varphi}_{ij}^{c'}}{\tilde{\varphi}_{ij}^c} \right) + \frac{1}{\sigma - 1} \ln \left(\frac{Y_j^c / Y_j}{Y_j^{c'} / Y_j'} \right)$$

- The difference between the Feenstra-Ratio and our "new" gains can be written as:

$$\Delta = \sum_{i=1}^{N} \left(\bar{\lambda}_{ij} - \bar{\lambda}_{ij}^c \right) \left(-\ln \frac{\tau_{ij}'}{\tau_{ij}} + \left(\ln \frac{w_j'}{w_j} - \ln \frac{w_i'}{w_i} \right) + \ln \frac{\tilde{\varphi}_{ij}^{c'}}{\tilde{\varphi}_{ij}^c} \right)$$

Methodology - Extensions

1. We generalize our methodology to multiple industries for our diff-in-diff calculations
2. Nontraded and intermediate goods can be introduced in the usual roundabout way
3. In a CES version with endogenous markups our decomposition remains unchanged
4. Changes in tariff revenue can be incorporated into the "traditional" gains from trade
5. In $\frac{\tilde{\varphi}_{ij}^{c\prime}}{\tilde{\varphi}_{ij}^{\prime}}$ partially captures within-firm selection effects if firms make multiple products
6. Quality differences modeled as preference shifters leave the decomposition unchanged

Application - Data

- CUSFTA was signed on January 2, 1988 and mandated annual tariff reductions over a ten-year implementation period starting on January 1, 1989
- We use micro data from the Canadian and US manufacturing censuses from 1978, 1988, and 1996 for Canada and 1987 and 1997 for the US
- The US census does not contain information on exports prior to 1987 and exports are not reported by destination so that we mostly use total US exports
- We use the 2-digit elasticity estimates from Oberfield and Raval (2014) in our industry-level analysis and work with the simple average otherwise ($\bar{\sigma} = 3.7$)

Application - Baseline results - Overall market shares

TABLE 1: OVERALL MARKET SHARES

A: Market shares of Canadian plants

Pre-trend				CUSFTA			
1978		1988		1988		1996	
Exit	Cont.	Cont.	Enter	Exit	Cont.	Cont.	Enter
24.4%	75.6%	78.4%	21.6%	28.0%	72.0%	81.2%	18.8%

B: Market shares of US exporters

CUSFTA			
1987		1997	
Exit	Cont.	Cont.	Entry
35.5%	64.5%	61.3%	38.7%

$$\underbrace{\frac{1}{\sigma-1}\ln\left(\frac{X_{ij}^{c}/X_{ij}}{X_{ij}^{c'}/X_{ij}'}\right)}_{\text{overall "new" gains}} = \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}}}_{\text{variety loss}} + \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c}}{\tilde{r}_{ij}}}_{\text{prod. gain}}}_{\text{loss from exit}} - \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}'}}_{\text{variety gain}} - \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c'}}{\tilde{r}_{ij}'}}_{\text{prod. loss}}}_{\text{gain from entry}}$$

▸ Panel B with trade data

Application - Baseline results - Extensive margins of market shares

TABLE 2: EXTENSIVE MARGINS OF MARKET SHARES

A: Shares of Canadian plants

Pre-trend				CUSFTA			
1978		1988		1988		1996	
Exit	Cont.	Cont.	Enter	Exit	Cont.	Cont.	Enter
51.7%	48.3%	35.5%	64.5%	49.6%	50.4%	56.2%	43.8%
(28,000 plants)		(38,000 plants)		(38,000 plants)		(34,000 plants)	

B: Shares of US exporters

CUSFTA			
1987		1997	
Exit	Cont.	Cont.	Entry
54.7%	45.3%	27.1%	72.9%
(29,000 plants)		(48,000 plants)	

$$\underbrace{\frac{1}{\sigma-1}\ln\left(\frac{X_{ij}^{c}/X_{ij}}{X_{ij}^{c'}/X_{ij}^{\prime}}\right)}_{\text{overall "new" gains}} = \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}}}_{\text{variety loss}} + \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c}}{\tilde{r}_{ij}}}_{\text{prod. gain}}}_{\text{loss from exit}} - \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}^{\prime}}}_{\text{variety gain}} - \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c'}}{\tilde{r}_{ij}^{\prime}}}_{\text{prod. loss}}}_{\text{gain from entry}}$$

Application - Baseline results - Intensive margins of market shares

TABLE 3: INTENSIVE MARGINS OF MARKET SHARES

A: Relative sizes of Canadian plants

Pre-trend				**CUSFTA**			
1978		**1988**		**1988**		**1996**	
Exit	Cont.	Cont.	Enter	Exit	Cont.	Cont.	Enter
47.2%	156.5%	220.7%	33.4%	56.5%	142.7%	144.4%	43.0%
(-12.8% productivity loss)				(-0.4% productivity loss)			

B: Relative sizes of US exporters

		CUSFTA	
		1987	**1997**
Exit	Cont.	Cont.	Enter
64.9%	142.4%	225.9%	53.1%
	(-17.1% productivity loss)		

$$\underbrace{\frac{1}{\sigma-1}\ln\left(\frac{X_{ij}^{c}/X_{ij}}{X_{ij}^{c'}/X_{ij}'}\right)}_{\text{overall "new" gains}} = \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}}}_{\text{variety loss}} + \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c}}{\tilde{r}_{ij}}}_{\text{prod. gain}}}_{\text{loss from exit}} - \underbrace{\underbrace{\frac{1}{\sigma-1}\ln\frac{M_{ij}^{c}}{M_{ij}'}}_{\text{variety gain}} - \underbrace{\frac{1}{\sigma-1}\ln\frac{\tilde{r}_{ij}^{c'}}{\tilde{r}_{ij}'}}_{\text{prod. loss}}}_{\text{gain from entry}}$$

Application - Baseline results - New gains from trade

TABLE 4: "NEW" GAINS FROM CUSFTA OF CANADA

A: Annualized welfare effects of domestic entry and exit (Canadian plants)

	Pre-trend	CUSFTA	Difference
Net welfare effect	-0.14%	-0.56%	-0.42%
Net variety effect	1.14%	-0.50%	-1.64%
Net productivity effect	-1.28%	-0.05%	1.22%

B: Annualized welfare effects of foreign entry and exit (US exporters)

	CUSFTA	Difference
Net welfare effect	0.19%	0.19%
Net variety effect	1.90%	1.90%
Net productivity effect	-1.71%	-1.71%

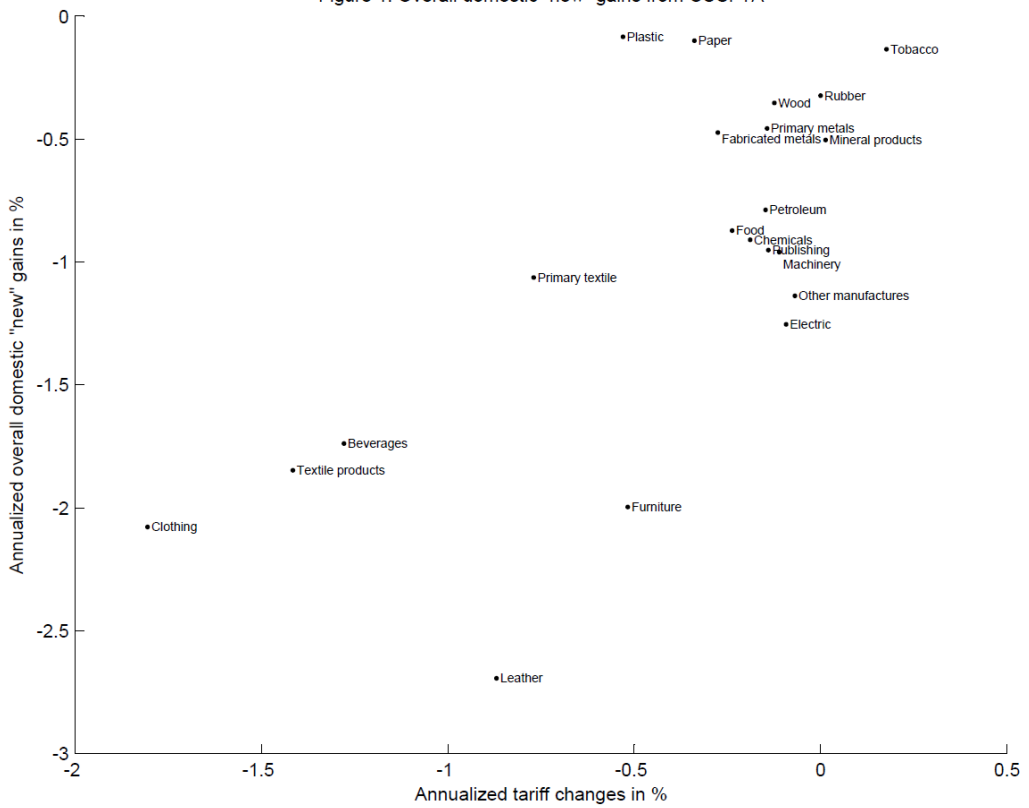
C: Annualized overall welfare effects of entry and exit

	Pre-trend	CUSFTA	Difference
"New" gains from trade	-0.11%	-0.34%	-0.23%
"New" variety gains	0.90%	0.20%	-0.70%
"New" productivity gains	-1.01%	-0.54%	0.47%

▶ More

Application - Industry-level results - Basic correlations

Figure 1: Overall domestic "new" gains from CUSFTA

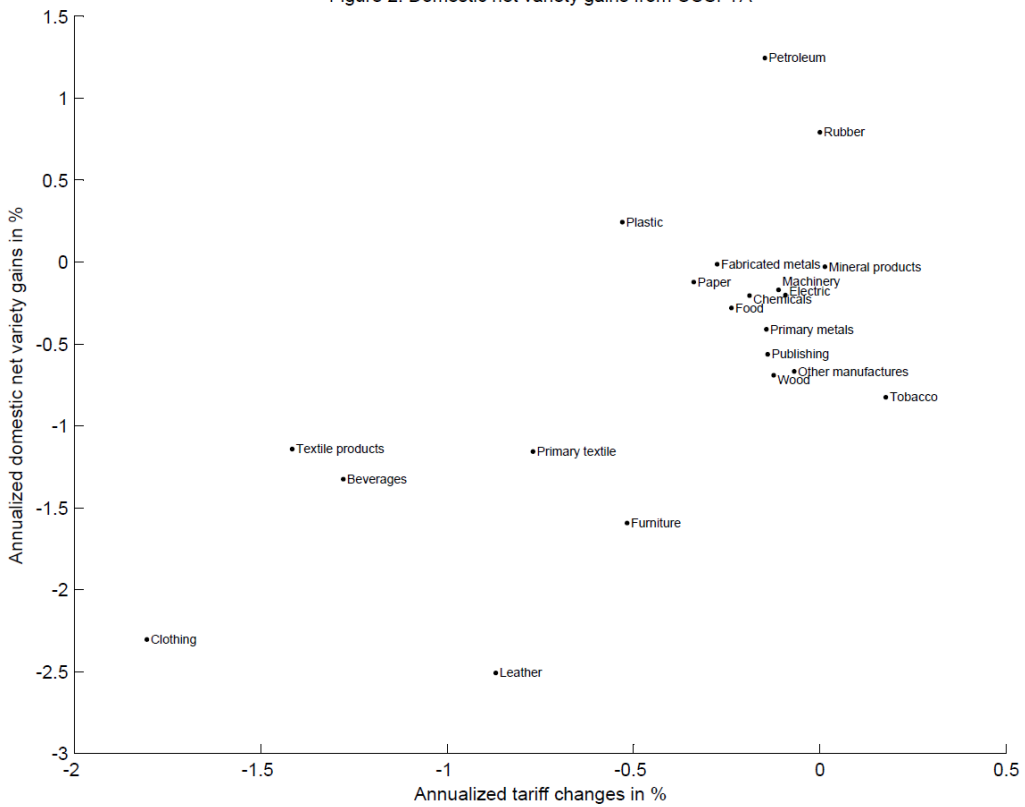


$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X^c_{ijs} / X_{ijs}}{X^{c'}_{ijs} / X'_{ijs}} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M'_{ijs}}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}^c_{ijs}}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}^{c'}_{ijs}}{\tilde{r}'_{ijs}} \right)}_{\text{net productivity gains}}$$

Entry and exit

Application - Industry-level results - Basic correlations (contd.)

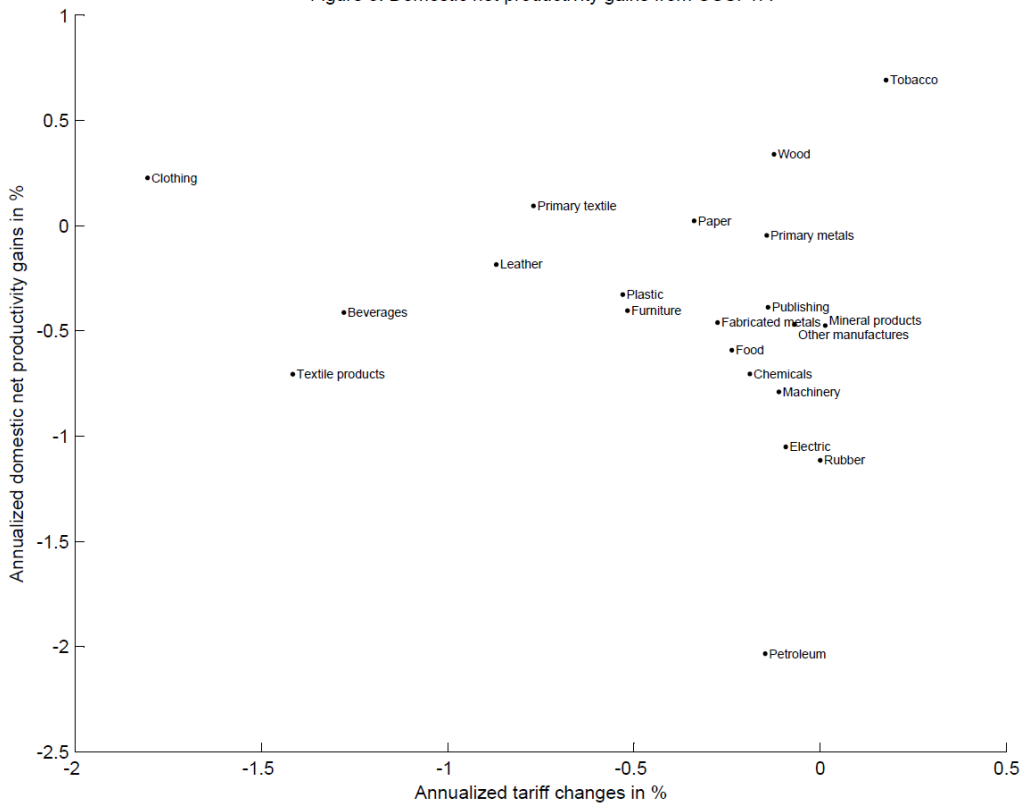
Figure 2: Domestic net variety gains from CUSFTA



$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X_{ijs}^c / X_{ijs}}{X_{ijs}^{c'} / X_{ijs}'} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M_{ijs}'}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}_{ijs}^c}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}_{ijs}^{c'}}{\tilde{r}_{ijs}'} \right)}_{\text{net productivity gains}}$$

Application - Industry-level results - Basic correlations (contd.)

Figure 3: Domestic net productivity gains from CUSFTA

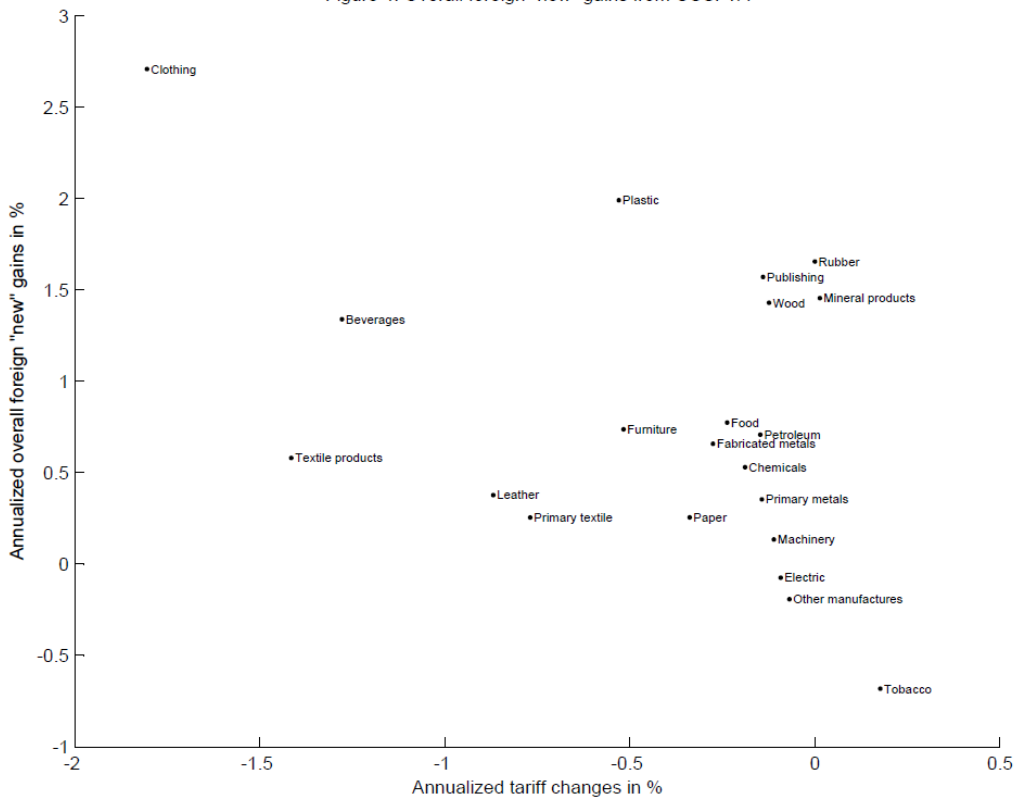


$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X_{ijs}^c / X_{ijs}}{X_{ijs}^{c'} / X_{ijs}'} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M_{ijs}'}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}_{ijs}^c}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}_{ijs}^{c'}}{\tilde{r}_{ijs}'} \right)}_{\text{net productivity gains}}$$

Exit

Application - Industry-level results - Basic correlations (contd.)

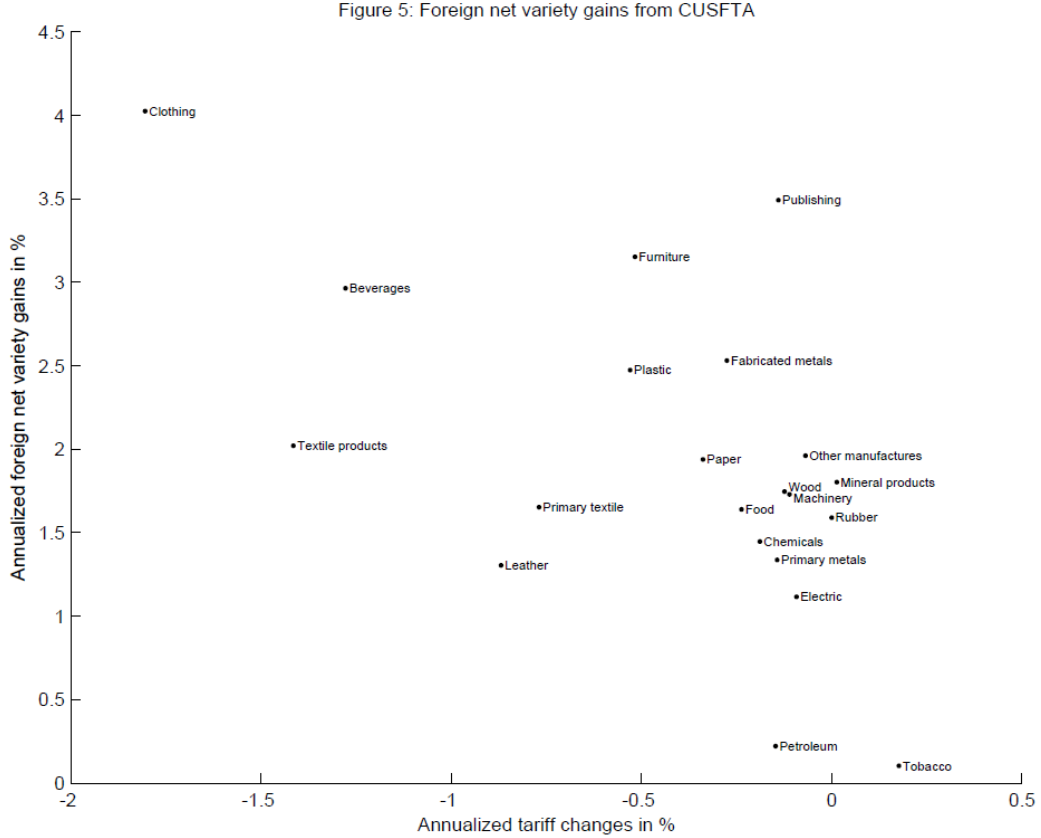
Figure 4: Overall foreign "new" gains from CUSFTA



$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X_{ijs}^c / X_{ijs}}{X_{ijs}^{c'} / X_{ijs}'} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M_{ijs}'}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}_{ijs}^c}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}_{ijs}^{c'}}{\tilde{r}_{ijs}'} \right)}_{\text{net productivity gains}}$$

Application - Industry-level results - Basic correlations (contd.)

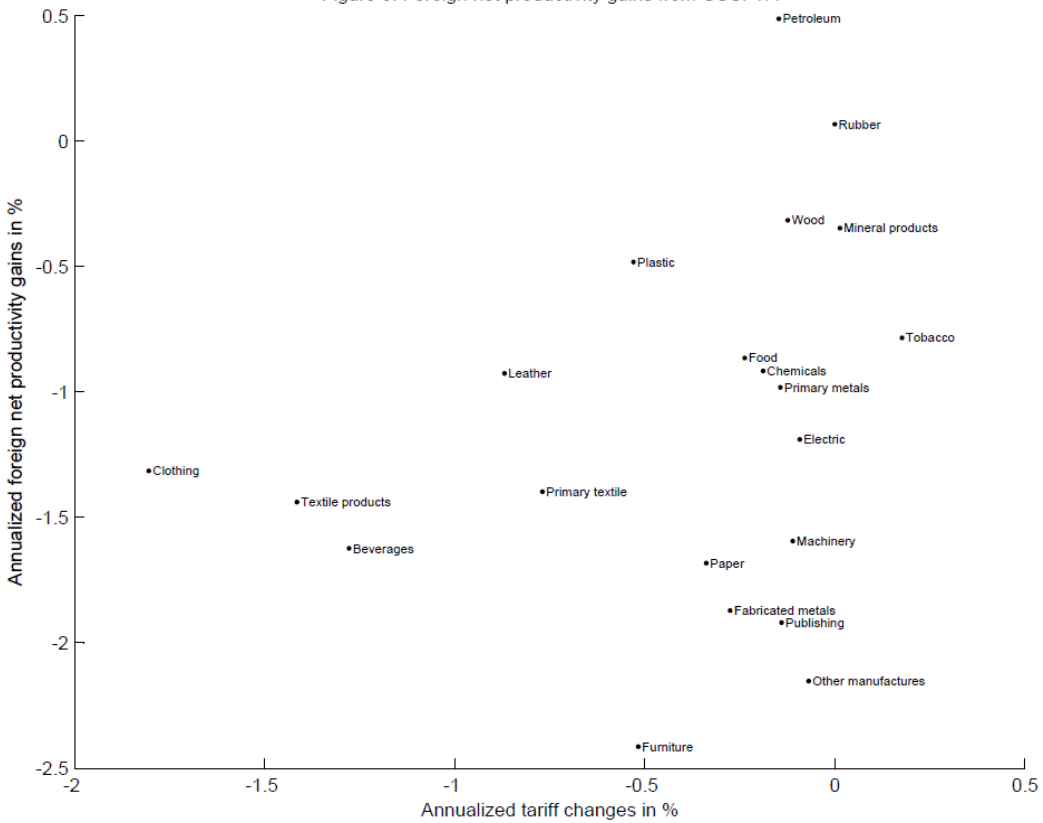
Figure 5: Foreign net variety gains from CUSFTA



$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X_{ijs}^c / X_{ijs}}{X_{ijs}^{c\prime} / X_{ijs}^{\prime}} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M_{ijs}^{\prime}}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}_{ijs}^c}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}_{ijs}^{c\prime}}{\tilde{r}_{ijs}^{\prime}} \right)}_{\text{net productivity gains}}$$

Application - Industry-level results - Basic correlations (contd.)

Figure 6: Foreign net productivity gains from CUSFTA



$$\underbrace{\frac{1}{\sigma_s - 1} \ln \left(\frac{X_{ijs}^c / X_{ijs}}{X_{ijs}^{c\prime} / X_{ijs}^{\prime}} \right)}_{\text{overall "new" gains}} = \underbrace{\frac{1}{\sigma_s - 1} \ln \frac{M_{ijs}^{\prime}}{M_{ijs}}}_{\text{net variety gains}} + \underbrace{\frac{1}{\sigma_s - 1} \left(\ln \frac{\tilde{r}_{ijs}^c}{\tilde{r}_{ijs}} - \ln \frac{\tilde{r}_{ijs}^{c\prime}}{\tilde{r}_{ijs}^{\prime}} \right)}_{\text{net productivity gains}}$$

Application - Industry-level results - Diff-in-diff

- We apply a flexible regression approach following Trefler (2004) which exploits cross-industry variation in tariff cuts
- First, we regress the industry-level sufficient statistics from our welfare decomposition on industry-level tariff cuts

$$\Delta y_{ijs} = \beta_0 + \beta_1 \Delta \tau_s^{CAN} + \epsilon_{ijs}$$

- Second, we average over the predicted Δy_{ijs} after excluding the constant using the appropriate Sato-Vartia weights

$$\sum_s \bar{\nu}_{js} \bar{\lambda}_{ijs} \hat{\beta}_1 \Delta \tau_s^{CAN}$$

- We explore various versions of these calculations also including US tariff cuts, Mexican tariff cuts, and pre-trends

Application - Industry-level results - Diff-in-diff (contd.)

TABLE 7: BASELINE MODEL VS. INDUSTRY DIFFERENCES-IN-DIFFERENCES

A: Annualized "new" variety gains

	(1) Baseline	(2) Diff-in-diff, CAN tariffs only	(3) Diff-in-diff, full CUSFTA	(4) Diff-in-diff, full CUSFTA w/ pre-trends
Domestic (weighted)	-0.36%	-0.26%	-0.32%	-0.27%
Foreign (weighted)	0.56%	0.05%	0.02%	0.02%
Combined	0.20%	-0.21%	-0.30%	-0.26%

B: Annualized "new" productivity gains

	(1) Baseline	(2) Regression, CAN tariffs only	(3) Regression, full CUSFTA	(4) Regression, full CUSFTA w/ pre-trends
Domestic (weighted)	-0.04%	0.04%	0.09%	0.07%
Foreign (weighted)	-0.50%	-0.02%	0.00%	0.00%
Combined	-0.54%	0.02%	0.10%	0.07%

C: Annualized overall "new" gains

	(1) Baseline	(2) Regression, CAN tariffs only	(3) Regression, full CUSFTA	(4) Regression, full CUSFTA w/ pre-trends
Domestic (weighted)	-0.39%	-0.22%	-0.22%	-0.20%
Foreign (weighted)	0.06%	0.03%	0.02%	0.02%
Combined	-0.34%	-0.19%	-0.20%	-0.18%

Application - Comparison with Trefler (2004)

- Trefler (2004) reports that the average employment of all firms grows about as fast as the average employment of continuing firms, $\frac{\tilde{l}'_{jjs}}{\tilde{l}_{jjs}} \approx \frac{\tilde{l}^{c\prime}_{jjs}}{\tilde{l}^{c}_{jjs}}$
- When interpreted through the lens of our model, this immediately implies that $\ln \frac{\tilde{\varphi}'_{jjs}}{\tilde{\varphi}_{jjs}} - \ln \frac{\tilde{\varphi}^{c\prime}_{jjs}}{\tilde{\varphi}^{c}_{jjs}} \approx 0$ since $\ln \frac{\tilde{r}^{c}_{jjs}}{\tilde{r}_{jjs}} - \ln \frac{\tilde{r}^{c\prime}_{jjs}}{\tilde{r}'_{jjs}} = \ln \frac{\tilde{l}^{c}_{jjs}}{\tilde{l}_{jjs}} - \ln \frac{\tilde{l}^{c\prime}_{jjs}}{\tilde{l}'_{jjs}}$
- Trefler (2004) calculates firm productivity by deflating nominal value added per worker with producer price indices which is inconsistent with the Melitz (2003) model
- In particular, $\frac{p_{jjs}(\varphi) q_{jjs}(\varphi)}{\tilde{p}_{jjs} l_{jjs}(\varphi)} = \tilde{\varphi}_{jjs} \frac{l^{v}_{jjs}(\varphi)}{l^{v}_{jjs}(\varphi)+f_{js}}$ in Melitz (2003) which only measures a function of firm productivity but not firm productivity itself

Application - Possible mechanisms

- Perhaps fixed costs are heterogeneous so that the most profitable firms which survive CUSFTA are not necessarily the most productive ones
- Perhaps the simple intuition from the one-sector model does not generalize to multiple sectors as Segerstrom and Sugita (2015) suggest
- Recall that our domestic productivity result is driven by entry and that we do not incorporate resource reallocations among continuing firms

Conclusion

- Using an exact decomposition based on a general heterogeneous firm model we found that the "new" gains from CUSFTA on Canada were negative
- Trade liberalization brings about selection effects among domestic producers and foreign exporters which all have to be taken into consideration
- The standard narrative can easily become misleading because the productivity effects do not overturn but only attenuate the underlying variety effects
- CUSFTA still left Canada better off overall because of larger "traditional" gains and we have little to say about within-firm productivity effects

Methodology - Melitz-Pareto

- It can be shown that in the special case considered by Arkolakis et al (2008):

$$\sum_{i=1}^{N} \bar{\lambda}_{ij} \left(\frac{1}{\sigma - 1} \ln \frac{M'_{ij}}{M_{ij}} + \left(\ln \frac{\tilde{\varphi}'_{ij}}{\tilde{\varphi}_{ij}} - \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} \right) \right) = 0$$

- Feenstra (2010) demonstrates that then also $\ln \frac{W'_j}{W_j} = \ln \frac{\tilde{\varphi}'_{jj}}{\tilde{\varphi}_{jj}}$ which arises because:

$$\ln \frac{\tilde{\varphi}'_{jj}}{\tilde{\varphi}_{jj}} = \sum_{i=1}^{N} \bar{\lambda}_{ij} \left(- \ln \frac{\tau'_{ij}}{\tau_{ij}} + \left(\ln \frac{w'_j}{w_j} - \ln \frac{w'_i}{w_i} \right) + \ln \frac{\tilde{\varphi}^{c\prime}_{ij}}{\tilde{\varphi}^{c}_{ij}} \right)$$

- These expressions are derived under the assumption that there are only changes in variable trade costs

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Application - Baseline results - Overall market shares (contd.)

TABLE: ALTERNATIVE CALCULATION OF US EXPORT MARKET SHARES

B: Market shares of US exporters

	Pre-trend				CUSFTA			
	1978		1987		1987		1997	
	Exit	Cont.	Cont.	Entry	Exit	Cont.	Cont.	Entry
Using micro data					35.5%	64.5%	61.3%	38.7%
Using exports to Canada	11.8%	88.2%	87.0%	13.0%	38.2%	61.8%	61.4%	38.6%

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Application - Baseline results - Details

- We find annualized "traditional" gains of 0.89% and "new" losses of -0.34% which adds to overall gains of 0.55%
- These "traditional" gains fall to 0.83% per year if Canada's tariff revenue losses are taken into account
- Allowing for nontraded and intermediate goods dampens all welfare effects a little since the adjustment factor is $\frac{\mu}{\eta} = 0.64$
- Third-country effects seem to be small when using trade data, changing the "new" losses from -0.37% to -0.31% per year
- The "new" losses amount to -0.22% per year instead of -0.34% per year if the Feenstra-Ratio is used

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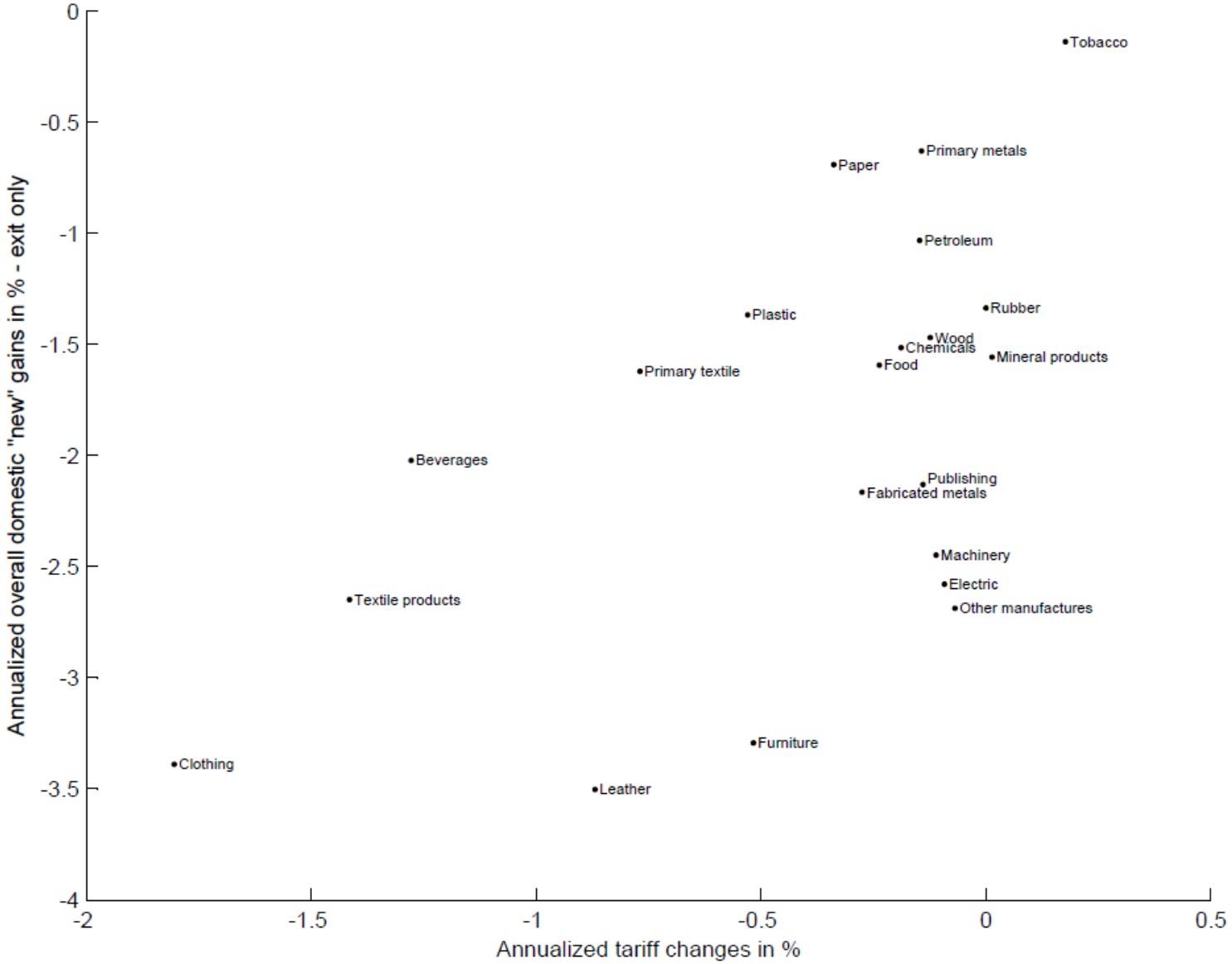
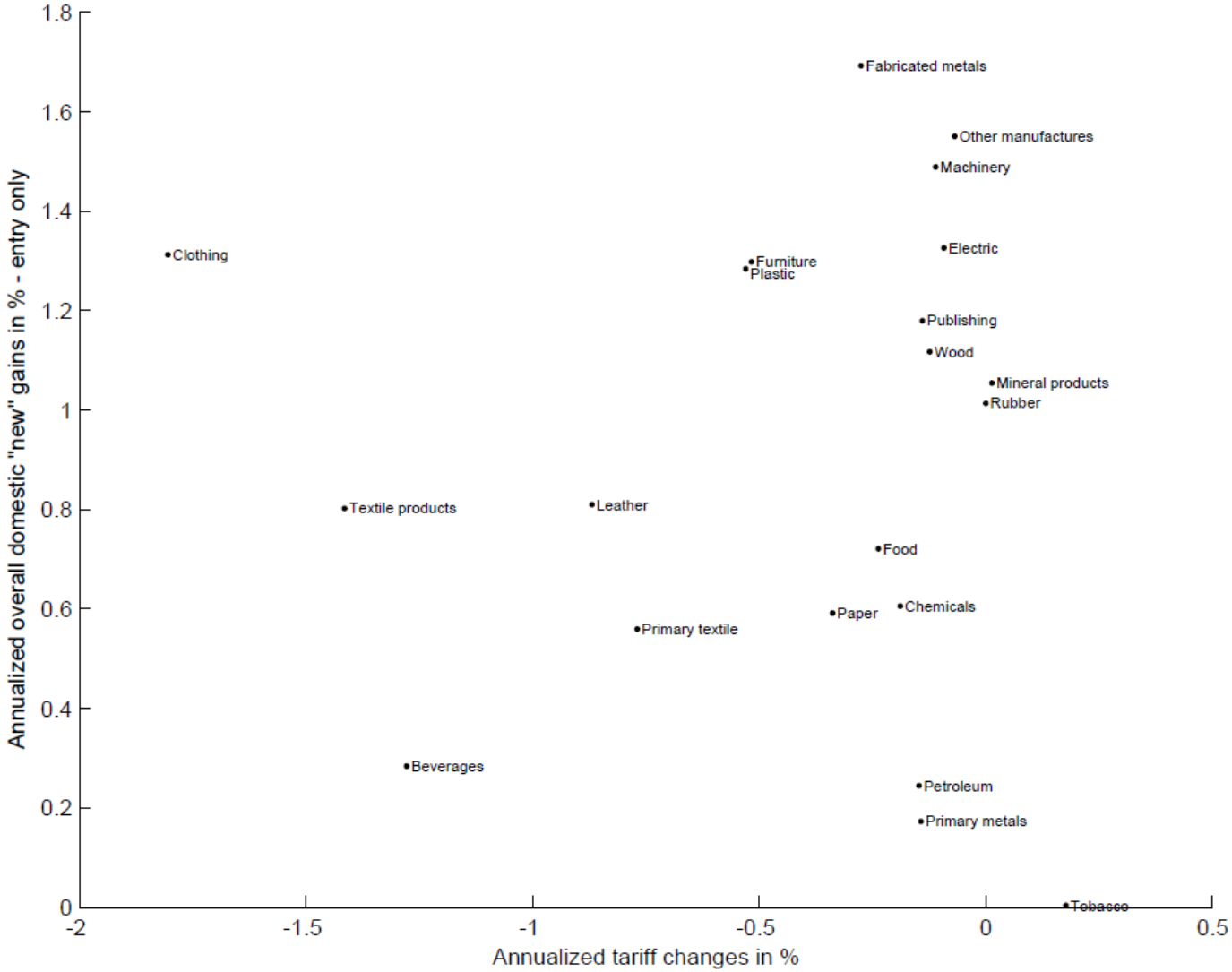
Application - Industry-level results - Basic correlations (contd.)

Figure 7: Overall domestic "new" gains from CUSFTA - exit only



Application - Industry-level results - Basic correlations (contd.)

Figure 8: Overall domestic "new" gains from CUSFTA - entry only



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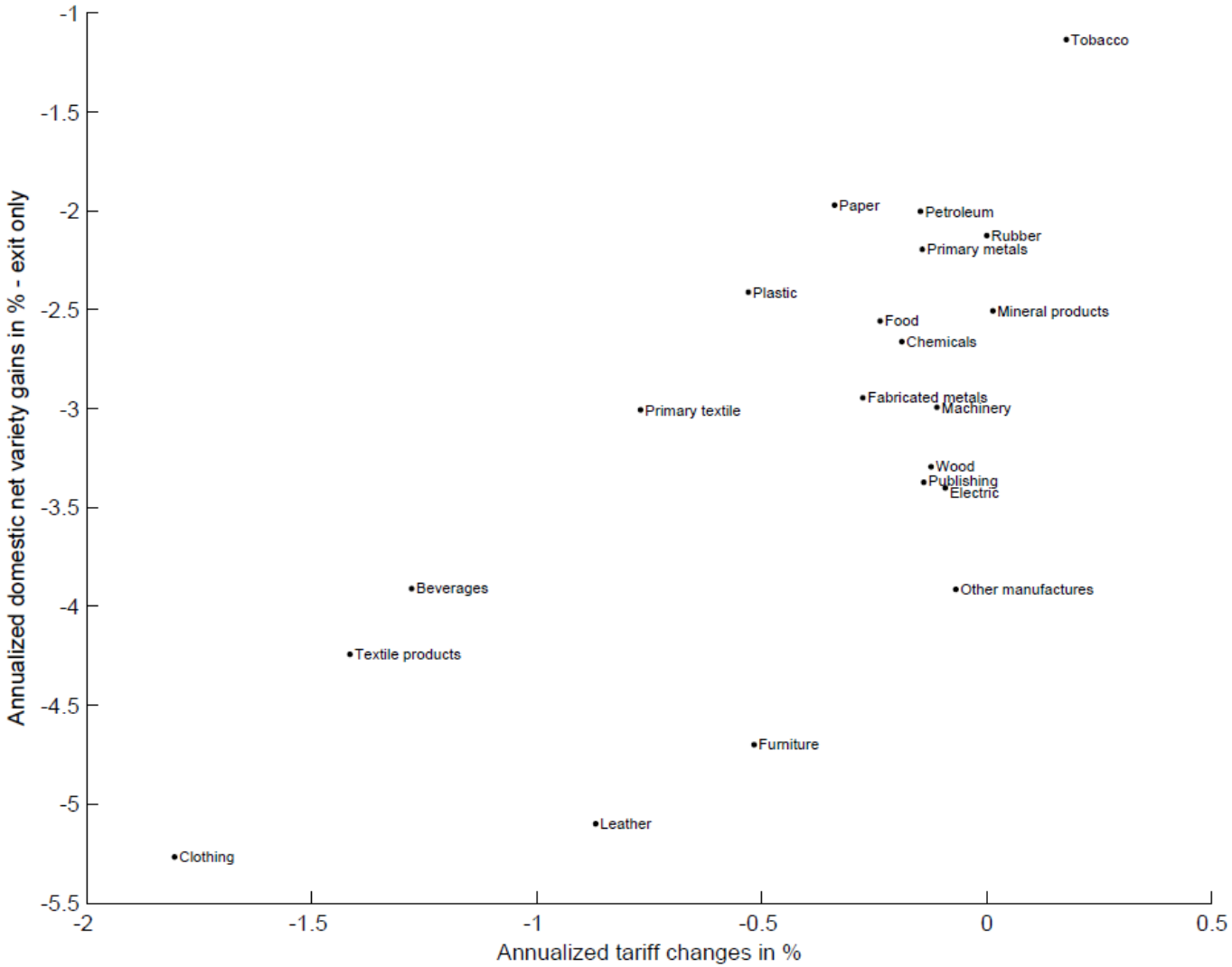
Application - Industry-level results - Basic correlations (contd.)

Figure 9: Domestic net variety gains from CUSFTA - exit only



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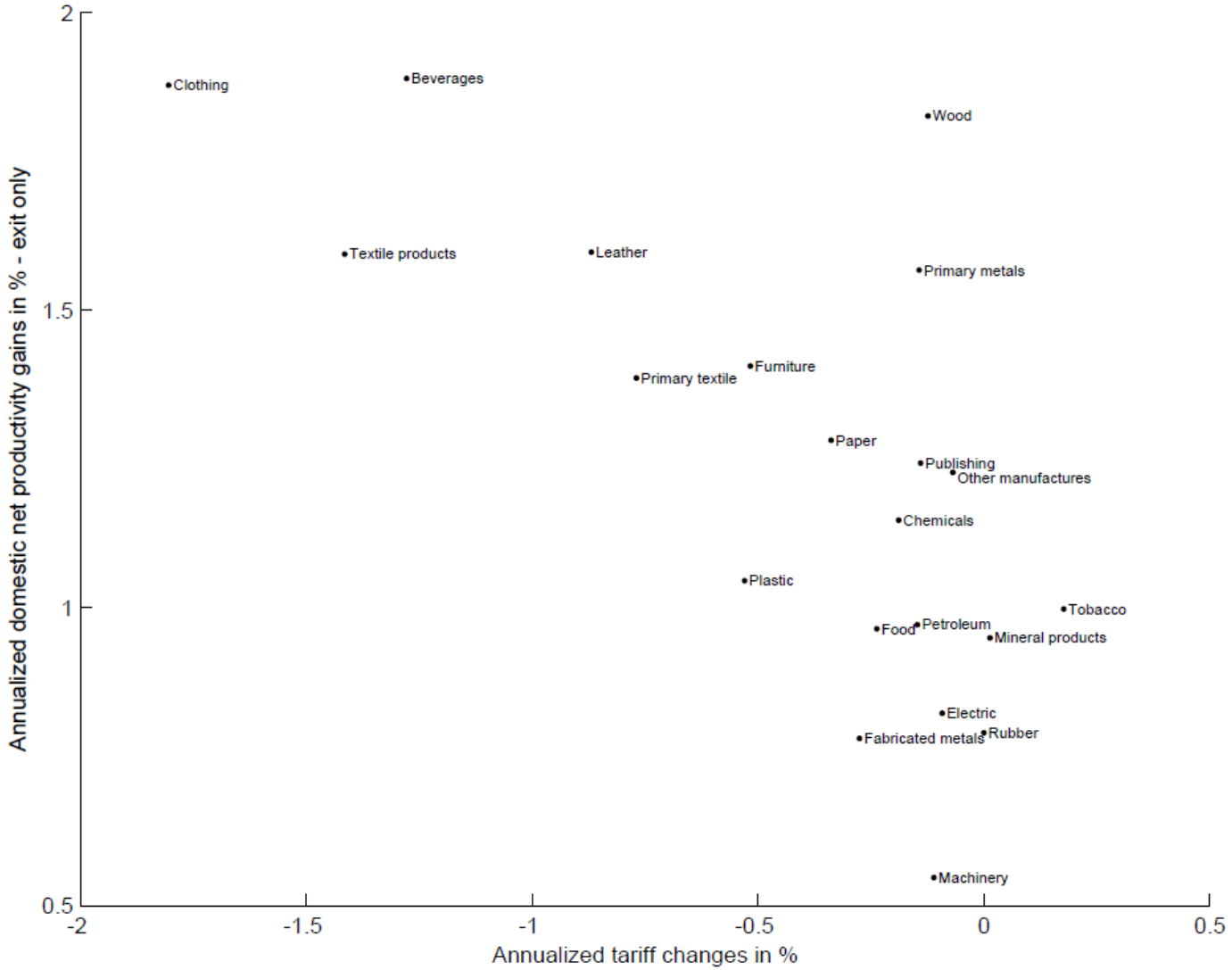
Application - Industry-level results - Basic correlations (contd.)

Figure 10: Domestic net productivity gains from CUSFTA - exit only



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